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The Preparation of Feed for Colts

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CONTENTS

SUMMARY AND CONCLUSIONS

1. Two years' work on the preparation of oats for colts showed that the colts made slightly larger daily gains on prepared oats than on whole oats.

2. The colts fed rolled oats required less feed for a pound of gain than those fed whole oats.

3. Prepared oats are not always as palatable to colts as whole grain. One colt refused to eat rolled oats even when mixed with whole grain.

4. Colts fed rolled oats had the appearance of being fatter at the end of each experiment.

5. The palatability of good quality roughage is not increased by grinding or cutting.

6. The general opinion seems to prevail that the advantage in chopping most hay is due to the reduction in waste rather than to an increase in digestibility or even palatability. Observations made during the trials roported in this bulletin bear out the above statement.

7. Colts required more time to consume chopped hay than they did whole hay.

The Preparation of Feed for Colts[1]

By A. B. Caine[2]

Correct feeding is one of the most important factors in the production of colts. Feed is the largest single item of expense, and any reduction that can be made in the amount required to grow colts to working age is of economic importance to the farmer.

During the period 1929-1930 prices of common feeds were extremely high, and as a consequence the cost of producing colts was increasing. Horse breeders had long since learned from experience that scant feeding of colts was not economical when the ultimate results were considered. The poorly fed colt was slow maturing, undersized and its usefulness for work may have been affected.

The question of preparing feeds in an effort to reduce feed requirements per 100 pounds of gain or increase the rate of gain on a given amount of feed is considered to be important by farmers.

When grinding is practiced horsemen generally coarse-grind all feeds that are prepared for horses. Finely ground feeds seem difficult for horses to digest, and the finer feeds are ground the more power that is required and the greater the cost.

REVIEW OF LITERATURE

The advantages or disadvantages of preparing feeds for colts have been the subject of a limited amount of experimental work. A brief summary of much of the published literature is herewith presented.

On the general subject of the preparation of feeds, Henry and Morrison (9) state that "The purpose of such artificial preparation of feed is to make it more digestible, to improve its palatability, or to permit the mixing of well liked feeding stuffs with materials which would otherwise be refused. In studying any method of preparing feeds farmers must not only consider

[1] Project 37, Iowa Agricultural Experiment Station.

[2] The author wishes to acknowledge the assistance given by Dr. A. E. Brandt for making a statistical study of the data and to Mr. Pierre Labrecque, a former graduate student in Animal Production.

the beneficial effect, if any, on the animals, but must also determine whether such effect is marked enough to warrant the added expense incurred."

Sanders (20) says "Clean, sound oats, ground or unground, constitutes the best of all grain foods for the colt; I prefer to have ground, and as cold weather approaches about one-fourth in weight of corn meal may profitably be added, as it helps to lay on fat and keeps up the animal heat."

Wallace (26) in Farm Live Stock of Great Britain writes "A sufficient allowance for a Shire or Clydesdale foal during the first winter is 2 to 3 pounds of crushed oats, 1/4 to 1/5 pound of bran and 3/4 pounds of finely ground linseed cake, given in two feeds in a day with 1/2 peck of roots and chopped sainfoin, lucerne, or clover hay." He further recommends the feeding of crushed oats and maize meal for the 2-year-old colts.

Edmonds and Crawford (5) in a recent publication when discussing the preparation of feeds asserted that "The saving in grain consumption by grinding corn and oats, crushing oats, or chaffing hay for farm horses having sound teeth is usually not enough to justify the expense, judging from experimental evidence.

"Freshly crushed oats, on the other hand, are a palatable, safe, bulky grain feed, and an oats crusher is a valuable piece of equipment in the stables of many professional horsemen and some farmers."

Jordon (12) discussing the grinding of feed declares: "Few points are more frequently questioned than the profitableness of grinding grain. There seems to be only two ways in which such preparation can enhance the nutritive value of a feeding stuff, viz., by diminishing the energy needed for the digestive processes and by increasing the digestibility. While not many experiments bearing upon the digestion side of this question are on record, their evidence is quite emphatic. In three trials with horses, with corn and oats, grinding caused an increase of digestibility varying from 3.3 to 14 percent."

Bull (3) states that "Grinding of feed probably increases the digestibility to a certain extent.

"In the case of animals with defective teeth, very young animals, horses at hard work, and dairy cows, it may be ad-

Fig. 1. Two Percheron and a crossbred colt used in the first experiment on the preparation of oats. Filly at the right made the largest gain of any of the colts in the trial.

vantageous to grind the feed, providing the cost of grinding is not too great. Wheat, barley, rye and emmer should be ground, crushed or rolled for all animals except sheep."

Gay (7) in his book on Productive Horse Husbandry concludes that, "Special preparation of the feed is of little advantage to the normal horse, under usual conditions. The crushing of oats at the ordinary mill is not considered worth while; although the installation of small mills in stables which are already supplied with the electric current, may bring the cost of crushing down to a point where the end justifies the means. For old or over-worked horses, the artificial mastication insures the more complete utilization of the feed. Crushed or rolled oats have a corrective effect on the bowels of horses prone to be washy, which would warrant their use in such cases."

Bell and Williams (2) state that "The benefits derived from grinding or crushing oats and corn for horses depend on the cost of preparation, working conditions and the condition of the animals' teeth. Throughout the Corn Belt corn is usually

fed on the cob or in the shelled form, and it ordinarily does not pay to grind it for horses unless the animals' teeth are in poor condition or if there is not time enough for proper mastication of the grain. All small, hard grains, such as rye, barley, and wheat, should be crushed or rolled before feeding, to avoid digestive disturbances, since horses cannot properly masticate those grains."

Hudson (11) observes that, "Horses do not care for finely ground, dusty foods. Crushed or cracked grain is best, as food so prepared results in more complete digestion and eliminates the dust.

"Oat crushers not only remove the dust and weed seeds from the grain but crack the hull. This allows more complete digestion. Crushed oats, though not always available, are more thoroughly digested and result in a saving if ten or more horses are to be fed."

Harvey (8) in a special bulletin says: "No preparation of the feed need be made unless the horses are old or their teeth are bad, in which case it would be best to grind the grain."

Lavalard (13) concludes that "Contrary to the opinion of some experts, the writer believes it is not necessary to grind grain for horses. This is especially true in the case of oats. It does not appear that the advantages gained by grinding are sufficient to cover the cost of the operation. In some of the earlier experiments, where ground grain was fed, it was noticed after a few months that the horses preferred to crush it themselves."

Lucas (15) concludes that the mechanical division of grain for horses, and especially that of oats, is unnecessary in the majority of cases, although there are exceptions where the teeth become worn out and where the young horses shed their teeth.

Steckley and Staples (24) commenting on the feeding of foals have this to say: "A mixture of three parts of oats to one part of bran is very satisfactory. It is more desirable to have oats crushed rather than whole for a colt of this age. It is doubtful, except for colts and old horses, whether the crushing of grain pays. Some horses are inclined to bolt whole grain but a little clean clover or alfalfa chaff mixed with it will make them eat more slowly."

Smith (21) states "Preliminary chopping of food does not help digestion in sound animals, and cannot replace the process of mastication in animals, in which the teeth are defective, for it is impossible to carry the process far enough unless the substances are actually milled or ground to a powder. Chopped food, in fact, may prove harmful by reducing the duration of mastication, and so decreasing the amount of saliva poured out."

Smith (22) further states: "By chopping food mastication is, to a certain extent, facilitated, since the mixing with saliva can only be perfectly performed when the food is thoroughly masticated. The principal object in chopping food is to enable it to be mixed with other materials so as to increase its tastefulness and digestibility, or to assist in the administration of other substances. Chopping should never be carried so far as to permit any of the food being swallowed without undergoing a certain amount of mastication. The readily digestible grains, of course, do not need to be ground, but in the form of meal they may be mixed with less digestible, bulky substance, such as chopped straw. Thorough mastication of the latter is so attained and the grain gives taste to the mixture, without which, probably, the food would be rejected."

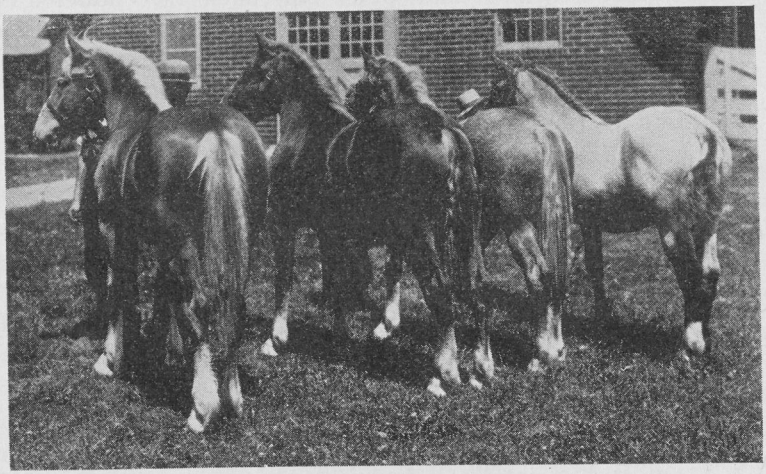

Fig. 2. Belgian fillies as they appeared at the end of the first experiment on the preparation of oats. Colt at the right made the largest gains of the four pictured above.

Villegas (25) in a rather exhaustive study of the practices of horsemen in the United States, found that many breeders use crushed oats or oats and corn ground for the feeding of colts. In other cases breeders used cut hay alone or mixed it with prepared grain.

Many horse breeders contacted by Villegas gained their knowledge and experience in the feeding of colts in European countries and are firm believers in the artificial preparation of feeds.

Linton (14) of the Royal (Dick) Veterinary College makes the following statement about bruised oats: "Numerous experiments have been made with horses to determine what, if any, is the advantage of bruising oats. The results have been very conflicting, some experiments claiming a definite and appreciable gain in digestibility when oats are bruised or crushed, while the feeding trials of others have not confirmed these conclusions. Summarizing the experiments that have been made, it is perhaps correct to assume that for horses, bruised oats are approximately 4 to 8 per cent more digestible than the whole grains, and for the practice to be economical the total increase of cost due to bruising must not be more than 8 per cent of the price of the whole grain."

The author gave the results of an experiment he conducted in which he found that with 25 draft horses each one required on an average 17.3 minutes to eat 3 pounds of whole oats and 16.1 minutes to consume the same amount of bruised oats.

Continuing Linton (14) states that "It is often erroneously concluded that oats are passing undigested through the intestinal tract of a horse because a few whole grains are noticed in the faeces; the truth is that whole grains are very conspicuous in horses' faeces, and a few visible whole grains are often given an exaggerated importance. Were the whole grains in the faeces passed in twelve hours to be recovered and counted, as the author has had done, it would be found that they form but a very small proportion of the whole ration.

"It is generally accepted that bruised grain is less likely to be swallowed unmasticated by a greedy feeder than when given whole. Bruised oats are useful for tired animals and for those that are old, emaciated or sick. They should also be given to young stock, such as calves and colts."

PREPARING HAY

The question of the preparation of roughages for farm animals of all kinds has been the objective of a number of experiments, but opinions differ on the advantages and disadvantages. The purpose of preparing a roughage is to make it more digestible, to improve its palatability, permit the easy mixing of palatable roughages with those less palatable, and reduce to a minimum the waste of coarser roughages.

Very little published literature is available that bears directly on the subject treated but summaries of bulletins and opinions of authorities are given which represent different views on the subject.

Regarding the value of chaffing hay, Henry and Morrison (9) state that "With horses at ordinary farm work, which have abundant time to chew their feed thoroughly, cutting or chaffing hay probably does not result in sufficient saving to warrant the expense, unless hay is high in price. However, in stables where large numbers of horses are kept, the hay is frequently chaffed. Somewhat less is then wasted, especially if it is of rather poor quality, and dust may be easily laid by sprinkling with water."

A further reason for chaffing hay suggested by the same authors is that chaffed hay may be mixed with ground, cracked or rolled grains. This method of feeding is frequently followed by horsemen because chaffed hay mixed with a heavy feed like wheat has a tendency to "lighten" it and make the concentrate easier to digest. Another reason for mixing prepared hay and grain is that colts are forced to eat the grain more slowly, which usually means that the grain is more thoroughly masticated and the opinion is that it will be more completely digested.

Henry and Morrison (10) further state, "A common practice in Europe is to mix cut straw with chaffed hay, more straw thus being eaten than would otherwise be the case."

Gay (7) asserts that "Cutting or chaffing hay or straw makes it possible to combine it with the concentrates of the ration to the mutual improvement of both. The roughage extends the concentrates, so that they will be more slowly eaten and more perfectly digested. The addition of the concentrates

induces the horse to eat more of the roughage, especially if the latter is straw."

Lucas (15) claims that chopping eliminates waste of roughages by preventing horses from pulling their hay out of the mangers and trampling it under foot.

On the general subject of preparation of feeds Michener (18) states that "Feed is prepared for any of the following reasons: To render it more easily eaten; to render it more digestible; economize in amount; to give it some new property; and to preserve it.

"The different grains are more easily eaten when ground, crushed or even boiled. Rye or wheat should never be given whole, and even of corn it is found that there is less waste when ground, and, in common with all other grains, it is more easily digested than when fed whole.

"Hay and fodder are economized when cut in short pieces. Not only will the horse eat the necessary quantity in a shorter time but it will be found that there is less waste and the mastication of the grains (whole or crushed) fed with them is insured."

Michener strikes a note or warning about mixing prepared feeds in the following statement, "One objection to feeding cut hay mixed with ground or crushed grains, and wetted, must not be overlooked during the hot months. Such feed is liable to undergo fermentation if not fed directly after it is mixed; even the mixing trough, unless frequently scalded and cleaned, becomes sour and enough of its scrapings are given with the feed to produce flatulent (wind) colic."

Armsby (1) discussing the cutting of roughages concludes that, "The digestibility of coarse fodders is not increased by cutting, and indeed, it would be difficult to conceive how that process could have such an effect, since in either case the feed is comminuted during mastication to practically the same extent."

Bell and Williams (2) comment on the preparation of feeds as follows: "The advisability of chopping, cutting or chaffing hay for horse feeding depends largely on the cost of preparation, the quality of the feed and its price. Ordinarily, low priced hay of good quality should not be prepared for feeding,

but it may be economical to chop, cut or chaff poor quality hay as it is eaten with less waste than the unprepared forage."

Smith (23) again states "Horses should always receive good hay unchopped, but the straws of the cereals should always be given in a chopped state, since horses will only take the hard straw in small amounts. Chopped food for horses should not be shorter than from one and one-third to two centimeters in length of each piece, since smaller pieces readily lead to obstructive colic, especially if given with meal in a moist condition."

McCampbell (16) in a trial at the Kansas Station compared alfalfa meal with wheat bran as a feed for horses. Results showed that "One pound of alfalfa meal is almost equal in feeding value to one pound of bran, and lessens the daily cost about one cent per thousand pounds of live weight. There are, however, some objections to its use as a horse feed. It is a disagreeable feed to handle, because, as it is finely pulverized and very light, a large part of it rises in a cloud of dust whenever handled in bulk."

REVIEW OF EXPERIMENTAL REPORTS ON THE PREPARATION OF FEEDS

The experiments reviewed, herewith, are not all concerned with colts but furnish useful information on the general subject.

Wilson and Curtiss (33) of the Iowa Agricultural Experiment Station conducted an experiment with colts in which uncut feeds were compared with ground feeds. The experiment was carried on with six weanling fillies, divided into two lots of three each. The duration of the trial was 79 days and the ration fed throughout was made up in the following proportions: Oats 150 pounds, shelled corn 50 pounds, barley bran 25 pounds, and oilmeal 25 pounds. Lot I had the corn and oats ground and mixed with a small amount of moistened cut hay. Lot II received the same amount and kind of grain unground, fed dry and without the cut hay. The lots received the same quantity of hay and stover, with salt at will. At the end of the trial, the ground feed lot had gained 472 pounds, while Lot II had gained 431 pounds, a difference of 41 pounds

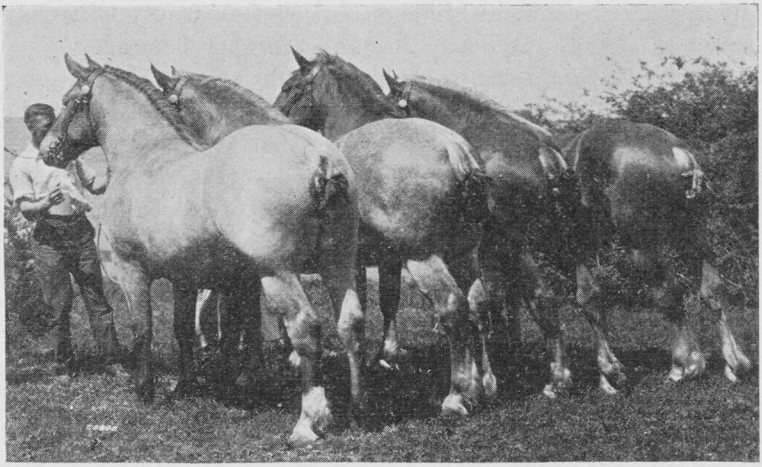

Fig. 3. Four Belgian fillies shown in fig. 2 as they appeared at the end of the second experiment.

in favor of the colts fed ground feed. It was, however, difficult to determine whether this difference was actually due to the feeding of ground grain or to cut hay.

The authors conclude that, "It is a commonly accepted opinion, however, where grain is high and the best results from feeding are essential, that it unquestionably pays to grind grain for horses."

Curtiss (4) carried on a trial where ground grain and cut hay were compared with unground grain and whole hay. Three colts were used in each lot and the experiment covered two periods of 40 days each. At the end of each period the rations were reversed. The grain consumption in each lot was the same, but the colts fed cut hay received slightly more hay than the other group. The gains also were larger during the periods when cut hay and ground grain were fed.

It would be difficult to ascertain whether the greater gains were due to increased consumption of hay or to the fact that the colts were fed prepared feeds.

Morrison, Fuller and Bohstedt (17) " . . . fed one lot of work horses whole oats while their team mates were fed

95 pounds of crushed oats for every 100 pounds of whole oats the first lot received. Both lots were fed the same amount of hay. After 56 days the rations were reversed and the trial continued for another period of 56 days. In each period the horses fed crushed oats gained very slightly more in weight than their team mates fed whole oats.

"The results of these two trials show that the saving by crushing or grinding oats for work horses whose teeth are kept in good condition is much less than has often been claimed, not amounting to more than 5 to 6 percent."

In a trial at Wisconsin, Roche, Fuller and Bohstedt (19) compared chopped timothy with the whole hay. One horse in each of eight teams was fed chopped hay and the other one whole hay. The horses getting chopped hay were fed 10 percent less grain. The report covers three trials of 16 weeks. At the end of 8 weeks the rations were reversed. The horses receiving whole hay gained 6.8 pounds during each 8-week period, while the other horses fed chopped hay (10 percent less grain) lost 19.2 pounds.

The investigators found that, "If the horses fed chopped hay had maintained their live weights as well as the others, the savings of 10 percent of the concentrates would have amounted to 229.9 pounds oats and 14.7 pounds bran for every ton of hay chopped. This at the prices used, $0.47 per bushel for oats and $32.00 per ton for bran, would have amounted to $3.62 for chopping a ton of hay. However, the horses on chopped hay ration failed to maintain their live weight equally well, lagging on the average 26 pounds by the end of an 8-week period, so that, to say the least, there was not as large a saving as was necessary to make the practice of chopping economical."

Edmonds and Kammlade (6) who conducted a series of experiments on feeding draft colts state that " . . . the ration fed Lot I in this trial, consisting of crushed oats 75 percent and bran 25 percent, fed with alfalfa hay supplemented with oat hay, was more satisfactory for the production of good, sound two-year-old Percheron fillies than any of the other rations used in these experiments."

Fig. 4. Colts used the second year of the experiment. Placed on feed as weanlings. Photographed as yearlings. These three colts were fed the same as the center pair in fig. 3.

ROLLED VS. WHOLE OATS AS A FEED FOR DRAFT COLTS

In an effort to find out what effects, if any, the feeding of rolled oats had on rate of gain, feed requirements and cost of feeding draft colts, two experiments were carried on at the Iowa Agricultural Experiment Station during the years 1929-30 and 1930-31.

The first year eight weanling colts, four Belgians, three Percherons and one crossbred (Belgian-Clydesdale), were placed on experiment which covered two periods of 63 days each or a total of 126 days. All colts were in good condition but not fat when the experiment began. They were all housed in two large box stalls of equal size with paddocks adjoining where they were turned daily for exercise. The colts were allotted according to age, weight, condition, sex and outcome.

RATIONS FED

The colts were divided so that two animals in each stall received the same ration. Four were fed whole oats, wheat bran, mixed hay (alfalfa-timothy), salt and a mineral mixture of iodized salt, 20 pounds; spent bone black, 40 pounds; ground limestone, 35 pounds; iron oxide (commercial), 2 pounds; and sulfur, 3 pounds. The other group was fed the same ration except that rolled oats were used in place of whole grain.

Three weights were taken at the beginning and end of each period and at regular intervals during the test. At the end of the first 63 days the rations were reversed and the colts that

had been fed whole oats received rolled and those that were fed rolled received whole oats. Each colt was tied and fed grain separately, but the hay was fed twice daily to the colts as a group.

When the first period started, one colt refused rolled oats for seven feeds and two others consumed very little grain for the first three feedings. When the rations were reversed one colt refused rolled grain for two feeds, but afterwards all seemed to relish the prepared grain. Whole oats were not refused by any of the colts at any time during the trial.

Table 1 summarizes the first experiment. It shows that the colts fed rolled oats made an average gain of 110 pounds while the other lot gained 95 pounds per head, a difference of 15 pounds. The average daily gain per colt for the first lot was 1.74 pounds compared with 1.50 pounds for the whole oats group.

When the rations were reversed, the colts fed rolled oats made an average gain of 91 pounds compared with 61 pounds for the other group. The average daily gains were 1.44 pounds and .97 pound, respectively. The amount of feed required for each pound of gain was smaller for the group fed rolled oats.

Though the colts gained more, on the average, when fed

TABLE 1. AVERAGE WEIGHTS, GAINS AND FEED CONSUMPTION OF COLTS FED WHOLE AND ROLLED OATS (WEIGHTS EXPRESSED IN POUNDS PER COLT.)

	Feb. 8 to April 11, 1930 1st period—63 days		April 12 to June 13, 1930 2nd Period—63 days	
	Lot 1 Rolled oats	Lot 2 Whole oats	Lot 3 Whole oats	Lot 4 Rolled oats
Initial weight	1043	1050	1153	1146
Final weight	1153	1145	1214	1236
Gain per colt	110	95	61	91
Av. daily gain	1.74	1.50	.97	1.44
Average daily feed:				
Rolled oats	9.79	———	———	7.68
Whole oats	———	9.86	7.46	———
Wheat bran	.75	.75	.75	.75
Minerals	.04	.04	.04	.04
Salt	.04	.04	.04	.04
Mixed hay	11.20	11.53	13.14	13.63
Feed per pound gain:				
Rolled oats	5.63	———	———	5.53
Whole oats	———	6.57	7.69	———
Wheat bran	.43	.50	.77	.52
Minerals	.02	.02	.04	.03
Salt	.02	.02	.04	.03
Mixed hay	6.43	7.69	13.55	9.47

rolled oats, there was considerable variability in their reactions, and the number of animals was so small that differences as large might be found between the same number of colts all getting the same ration. In other words, the differences are not statistically significant. Five of the eight colts gained more on rolled while three made the largest gains on whole oats.

SECOND EXPERIMENT

The second experiment was carried on with ten colts, six weanlings and four yearlings. The same experimental procedure was followed as with the first trial. The only change in the ration was the addition of ¼ pound of linseed meal daily and the reduction of the wheat bran to ½ pound daily per colt, and salt and the mineral mixture were fed *ad libitum*.

One of the yearlings in the group being fed rolled oats refused her grain after a few days, and it was impossible to get her to eat the prepared grain again. After trying unsuccessfully for about 10 days, it was decided to omit her record for the first period, which left only four head in this lot. All oats used, both whole and rolled, were out of the same bin and were examined carefully to see that only good quality feed was used.

At the beginning and end of each period in the second ex-

Fig. 5. Two of the five colts fed in one lot in the second experiment on the preparation of oats. These colts and the end two in fig. 3 were fed in the same lot. Photo of the fifth colt was not obtainable.

TABLE 2. AVERAGE WEIGHTS, GAINS AND FEED CONSUMPTION OF COLTS AND YEARLINGS FED WHOLE AND ROLLED OATS (WEIGHTS EXPRESSED IN POUNDS PER COLT).

	Jan. 10 to March 14, 1931 1st period—63 days		March 23 to May 24, 1931 2nd period—63 days	
	Lot 1 Rolled oats	Lot 2 Whole oats	Lot 3 Whole oats	Lot 4 Rolled oats
Initial weight	1085*	1170	1306	1280
Final weight	1202	1260	1399	1382
Gain per colt	116	89	93	102
Av. daily gain	1.85	1.42	1.48	1.61
Average daily feed:				
Rolled oats	9.22	———	———	9.07
Whole oats	———	9.36	9.19	———
Wheat bran	.50	.50	.50	.50
Linseed meal	.25	.25	.25	.25
Mixed hay	11.02	12.22	13.06	13.06
Feed for one pound gain:				
Rolled oats	4.98	———	———	5.63
Whole oats	———	6.59	6.21	———
Wheat bran	.27	.35	.34	.31
Linseed meal	.14	.18	.17	.16
Mixed hay	5.96	8.61	8.82	8.11

*One colt refused to eat rolled oats and her weight and feed records were not used in the first period of the second experiment.

periment a number of measurements such as heart girth, middle girth, rear girth, height at withers and hips were taken of each colt. Analysis of the data did not show any significant differences in the development of the colts as a group. The colts which made the largest daily gains, however, showed a greater increase in girth measurements.

Table 2 summarizes the second experiment.

The lot fed rolled oats made an average gain of 116 pounds, while the others gained 89 pounds, a difference of 27 pounds. The average daily gain was 1.85 pounds for the first group and 1.42 pounds for the latter.

In the second period after reversing the rations, the group fed rolled oats made an average gain of 102 pounds compared with 93 pounds for those fed whole oats, or average daily gains of 1.61 and 1.48 pounds, respectively. The advantage in rate of gain of 8.9 percent in favor of rolled oats was the smallest of either year the experiment was run. The colts when fed rolled oats made larger gains as a whole than did the others, but not in every case did each individual colt outgain the others.

The colts fed rolled oats required more time on an average

to eat the same amount of grain, by weight, than those fed whole grain. It might be assumed that slower consumption of grain meant more complete mastication and better utilization of feeds.

The differences between gains made by the colts the second year were less variable than those of the previous year, but again the number of animals used was too small to test adequately differences as small as those observed. The differences, however, the second year were more nearly significant than those of the first experiment.

Though the differences were not statistically significant either year, the fact that the average gains favored rolled oats both years leads one to believe that there is perhaps a real difference in the value of rolled and whole oats for feeding colts. A more comprehensive experiment must be conducted before definite conclusions can be drawn.

The cost of rolling oats varied from 12 to 15 cents per hundred pounds. This added 3.2 or 4.8 cents, respectively, to each bushel of oats used.

PREPARATION OF ROUGHAGES FOR DRAFT COLTS

The value of the preparation of roughages for draft colts is not generally known. Some trials in which cut hay has been used as part of the ration have been reported, but in many cases both prepared hay and grain have been used in the same ration, and it is difficult to know whether the prepared hay or grain affected the results.

OBJECT OF TRIALS

The objects of the trials described in this bulletin were: (1) To determine the effects of preparation of roughage on the rate of growth; (2) to determine the economy of gains; and (3) to note the difference in feed required for a pound of gain.

ANIMALS USED IN TRIAL

The animals used were raised by the Animal Husbandry Department and included both weanling and yearling colts. The first trial covered the 90 days from Feb. 23 to May 23, 1932, inclusive, and the second experiment was of 130-day dura-

tion. During the first year eight head of weanlings, four Belgians, and four Percherons, were used. The second year, Dec. 15, 1932, to April 23, 1933, 10 head were on trial, which included four yearlings and six weanlings. Soon after the second experiment began one colt was condemned by the veterinarians and was removed from the trial. The experiment was in no way responsible for the ailment contracted by this colt. The colts were divided as nearly equally as possible according to age, weight, breed, condition and outcome.

RATIONS USED

The ration used for one lot consisted of chopped hay (alfalfa and timothy), whole oats and wheat bran, while the other lot received uncut hay, whole oats and wheat bran. During the second year a small amount of linseed oilmeal was added to the ration. The same mineral mixture that was used in the experiment with prepared grain, and salt were fed *ad libitum*. The feeds used each year were from the same source, and the quality of the hay was very good. At the beginning of each trial enough hay was cut and stored in the mow to last for the entire experiment.

METHODS OF FEEDING AND MANAGEMENT

The colts were all kept in large box stalls with paddocks adjoining where all colts were turned daily for exercise. The colts were all tied and fed separately both grain and hay. The grain was fed in three equal feeds, and hay was fed twice daily. After the feeding period the colts were turned loose until the next feed. The mangers were all tight so that the chopped hay would not fall out. All refused feeds were weighed back and the total amount subtracted from the total feed given. All colts received water from the same source, and all were watered at regular intervals.

Three weights were taken at the beginning and end of each trial and at 15-day periods.

RESULTS OF EXPERIMENTS

Table 3 summarizes the results obtained in the first trial of the experiment on the preparation of hay.

TABLE 3. AVERAGE WEIGHTS, GAINS AND FEED CONSUMPTION OF COLTS FED CHOPPED OR UNCUT HAY. (WEIGHTS EXPRESSED IN POUNDS PER COLT.)

(February 23 to May 23, 1932.)

	Lot I Chopped hay	Lot II Uncut hay
Number of colts	4	4
Days on feed	90	90
Initial weight	1037.19	1047.19
Final weight	1197.49	1206.25
Total gain per colt	160.30	159.06
Av. daily gain	1.78	1.77
Average daily feed:		
*Chopped hay	10.67	———
*Hay (uncut)	———	10.76
Whole oats	8.88	9.00
Wheat Bran	.40	.40
Salt	*Ad libitum*	*Ad libitum*
Feed per pound gain:		
Chopped hay	5.99	———
Hay (uncut)	———	6.09
Whole oats	4.99	5.09
Wheat bran	.22	.23

*Equal parts of alfalfa and timothy by weight.

The data given in table 3 show very little differences in the results. The colts fed chopped hay made slightly larger daily gains on somewhat less feed than the colts in Group II, but the differences are too small to be significant.

The second experiment on the preparation of roughages

Table 4. AVERAGE WEIGHTS, GAINS AND FEED CONSUMPTION OF COLTS FED CHOPPED OR UNCUT HAY. (WEIGHTS EXPRESSED IN POUNDS PER COLT.)

(Dec. 15, 1932 to April 23, 1933.)

	Lot I Chopped hay	Lot II Uncut hay
Number of colts	5	5
Days on feed	130	130
Av. Initial weight	1121.66	1003.67
Total gain per colt	174.58	152.66
Av. daily gain	1.34	1.17
Average daily feed:		
Whole oats	9.33	9.19
Wheat bran	.50	.50
Linseed oilmeal	.20	.20
Chopped hay	11.68	———
Hay (uncut)	———	10.55
Salt and minerals	*Ad libitum*	*Ad libitum*
Feed required per pound gain:		
Whole oats	6.96	7.86
Wheat bran	.37	.43
Linseed oilmeal	.15	.17
Chopped hay	8.72	———
Hay (uncut)	———	9.01

covers a period of 130 days, and 10 head of colts were used consisting of six weanlings and four yearlings. The same procedure was followed as with the first experiment, and the rations were the same except that a small amount of oilmeal was added to the ration.

Alfalfa and timothy were fed equal parts, by weight, the alfalfa being fed in the morning and the timothy at night. It was observed that the colts refused a little more timothy than alfalfa, but the amount was insignificant.

The results of the second year were not in any way convincing. The colts fed chopped hay gained slightly more per day than the other lot, but at the same time they consumed more feed per day, and this could account for the difference in gains. The amount of feed required for each pound of gain favored Lot I, but again the difference was unimportant and not significant.

Averages of the results obtained in the two experiments are shown in table 5.

Table 5 shows that there were no significant differences in the results. When the cost of preparing roughages is added the results indicate that the additional expense would not justify the practice.

The hay was cut by an ensilage cutter modified for cutting hay. The cost of cutting was $2.50 per ton.

When good quality hay is used, 2 years' results indicate that there is no advantage in cutting hay for colts.

TABLE 5. AVERAGE WEIGHTS, GAINS AND FEED CONSUMPTION FOR TWO EXPERIMENTS. (WEIGHTS EXPRESSED IN POUNDS PER COLT.)

	Lot I Chopped hay	Lot II Uncut hay
Days on feed	110	110
Initial weight	1079.54	1025.86
Total gain	177.29	155.87
Av. daily gain	1.56	1.47
Average daily feed:		
Whole oats	9.11	9.10
Wheat bran	.45	.45
Linseed oilmeal fed only second year	——	——
Chopped hay	11.18	——
Hay	——	10.66
Feed required per pound gain:		
Whole oats	6.98	6.48
Wheat bran	.30	.33
Linseed oilmeal fed only second year	——	——
Chopped hay	7.36	——
Hay	——	7.55

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